Developing Accessible Software Applications and Content

Version 1.0

Introduction

Computers and the Internet in particular are today's fastest-growing communication tools. Now more than ever, designing good applications requires attention to content, design, and layout. People access the PC under a variety of circumstances. For those unfamiliar with accessibility issues pertaining to application page design, consider that many users may be operating in contexts very different from your own.

- They may not be able to see, hear, or move; or may not be able to process some types of information easily or at all.
- They may have difficulty reading or comprehending text.
- They may not have or be able to use a keyboard or mouse.
- They may have a text-only screen, a small screen, or a slow Internet connection.
- They may not speak or understand fluently the language in which the document is written.
- They may be in a situation where their eyes, ears, or hands are interfered with or are busy (e.g., driving to work, working in a loud environment, etc.).
- They may have an early version of a browser, a different browser entirely, a voice browser, or a different operating system.

Content developers must consider these different situations during design. While there are several situations to consider, each accessible design choice generally benefits several disability groups at once and the entire community as a whole. Accessible design means writing applications that consider these different groups.

Accessible applications do not have to be plain and text-based, but special care needs to be taken to avoid presenting material in a manner that excludes potential users.

IT Accessibility? How does it Impact People with Disabilities?

When you design or modify applications to allow access to people with disabilities, you make the service or product accessible. New applications are introducing new problems and barriers, such as complex graphics and multimedia that assistive technology simply has not solved.

One solution to these new problems is to put accessibility in the hands of the developer and content author. Creating an application that is accessible by people with disabilities is relatively easy as long as the developer and author follow some basic guidelines.

Assistive technology is a piece of equipment or a software product that is used to increase, maintain, or assist the functional capabilities of individuals with disabilities.

In short, it can be any device or technique that assists people in removing or reducing barriers and enhancing their everyday life activities.

Assistive technologies include:

- Magnifiers

- Screen readers
- Closed captioning
- Keyboard enhancements
- Highlighting software

Assistive technologies use the coding and content of your application and make it accessible. Meeting the standards of an accessible application first requires an awareness of the special needs of users who have disabilities.

The four main categories of disabilities are:

1. Visual
2. Hearing
3. Mobility
4. Cognitive and Learning Disabilities

13 Rules for Accessible Pages

1. Provide text alternates for all images.
2. Make meaning independent of color.
3. Identify language changes.
4. Make pages style-sheet independent.
5. Update equivalents for dynamic content.
6. Include redundant text links for server-side image maps.
7. Use client-side image maps when possible.
8. Put row and column headers in data tables.
9. Associate all data cells with header cells.
10. Title all frames.
11. Make the site script independent.
12. Synchronize multimedia equivalents.
13. Provide an option to skip repetitive links.

Source: General Services Administration

Elements of Disabilities

The first step to making an application accessible is simply awareness of the special needs of persons with disabilities. A person with a disability might encounter one or more barriers that can be eliminated or minimized by the developer, the browser, assistive technology, or the underlying operating system software and hardware platform.

Accessible Software Applications

As a designer, you first have to ask yourself what audience you are trying to reach, just like any other development project.

Then you have to get a basic understanding of key accessibility issues that disabled individuals might face when accessing your application or site. These issues include:

- How does a screen reader render tables on a page?
- What colors affect colorblind people?
- How does your site navigate with only a keyboard?
- What elements of the site are not accessibility friendly?
- What does the site look like in a text-only browser like Lynx?

If you have access to assistive technology tools, such as the text-only browser Lynx, test these elements with the accessibility tool.

Before starting the design process, it helps to build a general template or templates for each section of the site. The templates should include all the navigational elements and graphics associated with the design you want to use.

Graphics & Images

All graphics and images need alternative text, also referred to as Alt Text, Alt Tags or Alt Attribute. Most Assistive Technology (AT) applications need Alt Tags to properly access the application.

Alt Tags should provide a text description that conveys the same information that is communicated by the image. The power of text equivalents lie in their capacity to be rendered in ways that are accessible to people from various disability groups using a variety of technologies.

Images, movies, sounds, applets, etc. all need Alt Tags. Even an individual who cannot see may still use pages that include equivalent information to the visual or auditory content.

Remember, the equivalent information must serve the same purpose as the visual or auditory content.

Links that are images are not accessible to voice recognition software unless the author has provided alternative text for the image. Additionally, individuals navigating the application with voice recognition can say “click About Us” for the image whose alternative text is About Us.

Non-graphical browsers and screen readers cannot reveal images to visually impaired individuals. To communicate the information, the individual needs associated alternative text with all images, particularly active images such as links or buttons.

It is critical that the alternative text be meaningful, such as “search” or “go”.

When images are not active links, use alternative text appropriately. Remember that when a person listens to information they cannot ignore text like a person can when viewing the page. If images are not important or are redundant, assign empty alternative text so the assistive technology and non-graphical browser will ignore the image.

Quick Tips for Graphics and Multimedia

- Minimize the use of graphics.
- Never blur pictures to indicate unavailability.
- When graphics contain useful information, be sure to provide the information in text.
- Always refer users to alternate ways to get information contained in any graphics they encounter.
- Do not shrink down a picture of an actual page on your site and use it as a graphic (or button) on another page.
- If a graphic is used, always choose crisp and clear images.
- Be sure to make it easy for users to skip any multimedia and Flash demos.
- Avoid creating a text-only version of your site.

Text Equivalent for Images Used as Links

Provide text equivalent when images are used as links. Remember to provide a description of the exact label contained in the image. If the text for the image or graphic is labeled "OK," the alternative text should be labeled "OK."

Note: Keep your descriptions precise and brief. Individuals who "listen" to alternative text cannot ignore text the way an individual viewing the page can ignore the image.

Quick Tips

- Abbreviations tell screen readers how to pronounce words.
- Avoid using images as the only method for linking to something.
- Avoid very small buttons and tiny text for links.
- Carefully consider the use of parentheses and asterisks.
- Choose text colors for good contrast.
- Create links within text when it makes sense. Use additional buttons only when necessary.
- Create good contrast between text and the page background.
- Do not use very small text for body text.
- Do not rely on a background image as a page background to create contrast with text.
- Important commands should appear as unique links.
- Initials and acronyms help screen readers in pronunciation.
- Leave space between links and buttons.
- Limit the number of links on a page.
- Make sure it is possible to magnify your site.
- Stay away from small or subtle text headings and categories.
- Test a site's text, fonts, and colors with screen magnifiers.
- Write concisely and remove superfluous text.
- Underline all links.

Navigation

When a navigation bar appears down the left side or at the top of a page, individuals who are reading the page with assistive technology, such as a speech reader, must listen to all links down the left side and across the top before getting to the main content.

This happens on each page visited on the application or site when consistent layouts are used. Sighted individuals can ignore the links and go directly to the main content.

Techniques for Skipping to Main Content

It is very helpful to allow individuals to bypass groups of links. For example, skipping navigation bars and tables of contents allows users to get to other portions of the site.

Some techniques for skipping to the main content can include any of the following: image link to the main content, heading skips, image map skips, and text to link to the main content.

Quick Tips for Navigation

- Be sure to design pages using a consistent format.

- Confirm the agency/organization name as soon as the homepage has loaded.
- Confirm the page name once it has loaded.
- Do not associate the word *homepage* with your agency/organization logo if you plan to reuse the same graphic on all pages.
- Minimize the need for scrolling.
- Keep all possibilities in the same vicinity when offering choices.
- When offering choices, warn the user that the choice is coming and let them know how many options they have.
- Use Skip Links or navigational elements.

Image Link to the Main Content

One effective technique is to add a link to the top of the page and attach that to an image. A person using a speech reader can activate the link and skip to the main content of the page.

The alternative text for the image is "skip to main content." This is displayed in graphical browsers when the individual moves the mouse over the image.

Heading Skips

Assistive technologies use heading elements, such as H1 and H2, to navigate through a page. If the main content is under the first heading, then the individual can navigate or jump directly to the main content.

Image Map Skips

If navigation links are marked up in client-side image maps with alternative text on the image map areas, most screen readers will automatically skip the individual areas. The screen reader will announce what is being skipped. Most screen readers allow the individual to override, if desired, and they can stop and step through all of the individual map areas.

Text Link to the Main Content

A text link is another simple alternative that can be used to skip to main content. For example, a textual skip navigation link is displayed at the top of the page instead of an image.

Client-Side Image Maps

If you use images or graphics for client-side image maps with multiple hotspot regions, assign alternative text for each hotspot area of the map.

Server-Side Image Maps

It is important to provide a list of equivalent text links for server-side image maps. Be sure to include one text link for each hotspot that can be activated on the map.

Audio – Multimedia

For individuals who are deaf or hard of hearing, audio content is not accessible. Videos without descriptions are not accessible to the blind or visually impaired. Individuals who have hardware or environment limitations need alternative formats and captions.

All of the individuals mentioned above would need the information to be provided in an alternative format. Remember, important information contained in audio or video must be available in text.

Techniques for Creating Accessible Multimedia

Make a distinction between a transcript and a description of multimedia content for an accessible application or site. Descriptions and transcripts can be on the same page, on a separate page, or on a page with a listing of the descriptions of all significant clips on the site.

One way to handle this is to create a hyperlink to the transcript and description near the multimedia clip. Additionally, you can integrate the description into an available track of the multimedia content.

When designed in this manner, individuals will be able to select the transcript and description links or select the appropriate track of the multimedia content.

Audio

Captioning is a transcript that is synchronized with media. A transcript is a word-for-word textual version of the speech and other sounds that help the individual understand the audio content.

Video

A description summarizes any visual information, including action, settings, situations and characters that are needed to understand the video. It is helpful to note that a description of a video track is different from a transcript.

The description of the video should be made available in both text and audio form in order to be fully accessible. The description can be both subjective and artistic; however, this depends on the author's intentions.

One way to handle this is to create a video description that contains:

1. All sound and speech (like a transcript)
2. Descriptions of all visual information
3. Visual information with the original audio on a separate audio track or file

Experts feel that the recorded video descriptions integrated with the original audio offer the most effective solution for the blind and visually impaired.

Accessible Designing

Do Not Rely on Color Alone to Tell Your Message

Color is used more and more these days to help convey information. The use of certain colors in certain ways can cause difficulty when navigating software, and even total illegibility in some cases.

If the page conveys information by color alone, individuals who cannot identify or distinguish colors will not be able use the information.

Most graphic browsers allow individuals to override the color of text on the page, but individuals have no control over the color or contrast of images that contain text. Studies report that one in twelve men have some measurable degree of color vision deficiency.

The following situations will cause accessibility issues:

- Color used as a unique marker to emphasize text.
- Text that inadequately contrasts with background color or pattern.
- Browsers that do not support user override of author's style sheets.
- An image with insufficient foreground and background color contrast.

Asking individuals to click the red icon or button is not useful if they can't distinguish the red icon from other icons on the screen.

Context and Markup

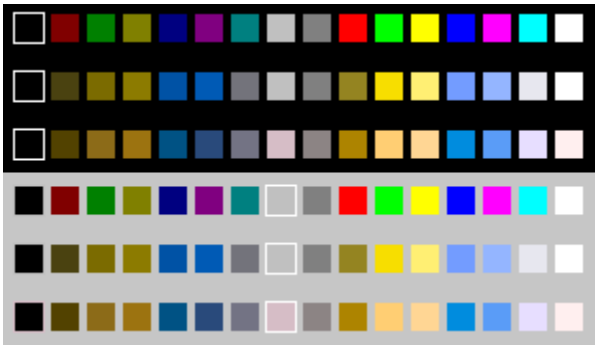
When color is used to convey important information, be sure to use context and markup to convey the same information.

Images with Contrast

It is important to use the proper contrast for images. When you have an image containing text, use either light text on a dark background or dark text on a light background to provide good contrast.

Safe Colors - Palette Files

Windows' 16-color palette gives a clear idea of which colors are likely to cause confusion.



Source - http://more.btexact.com/ces/colours/pal_files.htm

Accessible Techniques – Flickering and Blinking Content

There are many problems associated with flickering, moving, and blinking content. Examples include but are not limited to:

- Individuals with cognitive, learning or visual disabilities may be unable to read moving text quickly enough.
- Flickering, blinking, or movement on a page can create such a distraction for an individual with a cognitive disability that the entire page becomes incomprehensible.
- Some assistive technologies like Screen Readers cannot read moving text. Therefore, an individual who is blind will miss the information entirely.

- Auto refreshing pages or timed response pages can also present problems for individuals with physical or cognitive disabilities. They may not be able to interact with the pages accurately or quickly enough.

- Flashing and flickering can trigger a seizure in people with photosensitive epilepsy.*****

  ***** Flickering or flashing at 4 to 59 flashes per second with peak sensitivity at 20 flashes per second, as well as quick changes from dark to light, can trigger a seizure in people with photosensitive epilepsy.

User agents do not allow individuals to control flickering or blinking, so it is necessary to avoid:

- Causing the screen to flicker or blink.

- Using markup that redirects pages automatically

- Setting up redirects on the server.

- Creating auto-refresh pages that periodically refresh.

One way to implement movement is with style sheets.

- Use style sheets with scripting to create movement. This will allow the individual the opportunity to turn off style sheets and ultimately end the movement.

Accessible Forms

For accessible forms, labels must be visually clear and located near the corresponding FORM elements, such as text input fields.

Labels should also be explicitly associated with the FORM elements through HTML markup.

Associating Labels with Form Controls

Some form controls, such as submit buttons, are automatically associated with a label. Other form controls, such as text fields, check boxes, and radio buttons are not automatically associated with the labels.

If the labels for controls follow convention and are positioned immediately to the left of the control or immediately above the control, then assistive technology might be able to determine the intent as conveyed by proximity.

However, to ensure the label is accessible to assistive technology, label the element to specify labels for controls that do not have implicit labels. Be sure each label element is associated with exactly one form control. For more information on creating accessible labels see WebAIM.

Quick Tips

- Carefully consider how long it will be before a timeout will occur.
- Do not rely on only an asterisk (*) to indicate required fields.
- In forms, put the **Submit** button as close as possible to the **last field entry box** or **selection tool** on the form.
- Limit the amount of information required in the form and collect only the minimum needed.
- Make tab order logical.

- Match the tab order to the visual layout when possible.
- Offer standard entry fields for phone numbers.
- On any page with a single selection box or entry field, put the **Go** button as close as possible to that box or field.
- Put any instructions pertaining to a particular field before the field, not after it.
- Remember to put the text for field labels very close to the actual field.
- Remember to stack fields in a vertical column.
- Stay away from red text or yellow highlighting to indicate form errors.

Accessible Tables

Even with assistive technology, navigation is a serious problem for people with disabilities, especially individuals that use screen readers and talking browsers. This is particularly true of a page that is structured with layout tables. The Section 3.1.3 of the Web Site Standard (ITRM GOV106-00) prohibits the use of tables for layout unless the table makes sense when *linearized.*

Screen readers and talking browsers use a technique called *linearizing* to convert a page to a sequence of words and lines. If a cell of a table contains a table, that table must be linearized before moving on to the next cell.

Assistive Technology:

- Converts images to their alternative text.
- Spreads out (linearizes) the tables one cell at a time.
- Works from left to right across each row.

Quick Tips

- Avoid using large tables. If used, also provide the information in text.
- Be sure visible alphabetic lists in tables match the alphabetic list screen readers will process.
- Before using a column layout, consider how it will appear for screen magnifier users.
- Do not use graphics to indicate a state, such as yes/no or on/off.
- Describe all frames.
- Summarize all tables.

Accessible Graphs and Charts

A chart or graph is essentially an image with detailed information. An equivalent alternative to the essential information that is visually available from the chart or graph must be provided for text browsers and screen readers to interpret.

The amount of alternative information to provide depends on the contextual use of the chart or graph, but generally it should include all the information available to the sighted individual.

Follow these techniques for accessibility:

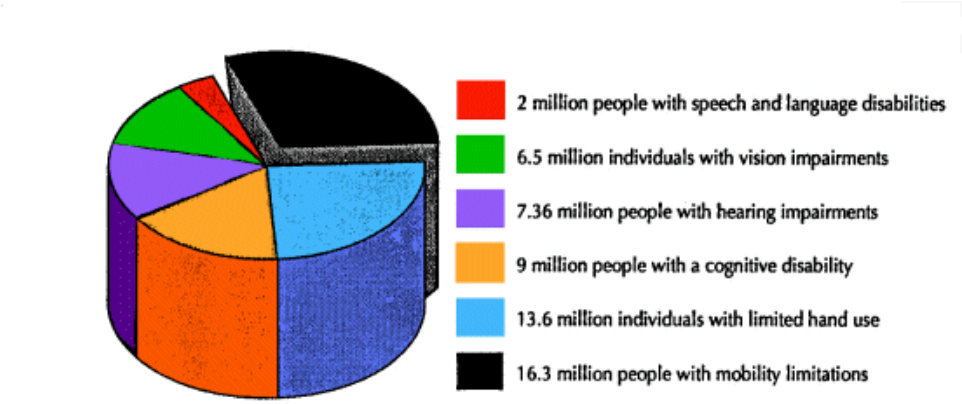
- Surrounding Text
- Long description ("longdesc")
- D-link (description link)

Deciding when to use each technique depends on several things:

- Contextual use of the chart or graph
- Importance of the data
- Visual design considerations and support in the browsers

Surrounding Description Text

Include a description of the information in the graph or chart as text surrounding the image.



Percentage of Americans with Disabilities: 2 million people with speech and language disabilities, 6.5 million individuals with vision impairments, 7.36 million people with hearing impairments, 9 million people with a cognitive disability, 13.6 million individuals with limited hand use, 16.3 million people with mobility limitations.

Long Description

This technique is used when it is not desirable to include all the detail about data from the graph in the surrounding text. However, until most browsers support the long description attribute, it is necessary to use the D-link (description link) technique with the longdesc attribute.

Use the longdesc attribute to point to a URL that contains a detailed description and data.

D-Link

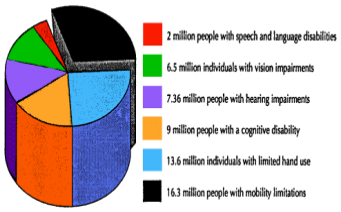
Use this technique when it is necessary to include all the detail about the graph or chart in the surrounding text. The description link or D-link is used to access a URL containing the detailed description of the graph or chart.

To minimize the effect on the visual appearance of the page, use the letter D as the link text.

For example:

Information about the size and shape of the wedges that make up the pie chart are only available from the visual image. Include a detailed description so an individual with disabilities can understand the visual concept.

```
<img src="piechart.gif" alt="2 million people have speech and
language disabilities, 6.5 million individuals with vision
impairments, 7.36 million people with hearing impairments, 9
million people with a cognitive disability, 13.6 million individuals
with limited hand use and 16.3 million people with mobility
limitations. ">
<a href="piechart_desc.html">D</a>
```



D

Accessible Frames

When an individual using assistive technology visits a Frameset page, they must choose which frame to open. They select the frame they want from a list of frames on the page.

It is critical to provide meaningful frame titles, so the individuals can easily identify the frame they want to open.

Accessible Frame Navigation

Accessible frame navigation should follow two techniques:

1. Include meaningful titles on the source page for each frame by using the title element.
2. Assign a meaningful name attribute and title attribute for each frame element on the Frameset page.

The source of the frame element should always be an HTML file, not an image file. If anything other than an HTML file is used, the Alt Attribute cannot be added. To do so would make the frame inaccessible.

Using the NOFRAMES Element

NoFrames is used to specify equivalent content for user agents that cannot support frames or are configured not to display frames. The previous example shows the NoFrames element specifying pages that make up the frames.

Another alternative is to create a separate page that combines the content from all the frames into a single page. This would create an equivalent non-frames version of the site.

Scripts, Applets and Plug-Ins

Most non-graphical browsers do not support JavaScript, applets, or many plug-ins. Many of these technologies were developed specifically for visual, audio, and interactive effects.

If an application uses these technologies, an equivalent alternative must be used or the application is inaccessible.

JavaScript

JavaScript can interact with HTML source, enabling developers to enhance sites with dynamic content, visual effects, and client-side processing. JavaScript can also create a barrier to accessibility when the capabilities are disabled in the browser or when the individual is using a browser that cannot support scripts. If scripts are used to create content, and the individual's browser does not support scripts, no content is generated or rendered.

Applets

Applets create a barrier to accessibility when the capability of running an applet is not supported by the browser or by the assistive technology. The content and programming might still be inaccessible even if the browser and assistive technology combination supports applets. Inform the individual of the existence of the applet and provide an equivalent alternative in HTML if the applet programming and content is not accessible.

Plug-ins

A lot of plug-in technologies were developed to support new visual and audio effects and ensure that the important content is accessible. If you know your audience, select a plug-in that supports their browser.

- Many audio players are compatible with screen readers, and the audio content is accessible to the blind and people who have low vision.
- An equivalent alternative to the audio content is needed for people who are deaf or hard of hearing.
- Video content is accessible to the deaf and hard of hearing, but an equivalent alternative to the visual content is needed by the blind.
- Plug-ins that provide interactive content usable with only a mouse are not accessible and require an equivalent alternative.

How Style Sheets Benefit Accessibility

Cascading Style Sheets are a huge benefit to accessibility. The main benefit is that they separate document structure from presentation. CSS were designed to allow precise control (outside of markup) of:

- Character spacing
- Text alignment
- Object position on the page
- Audio and speech output
- Font characteristics

By separating style from markup, developers can make the HTML simple and clean and, at the same time, make the documents more accessible.

Also, see the VITA/DRS WATG (Web Accessibility Template Guide) site for more detail on using CCS at: http://www.vadsa.org/watg/css.htm

Layout and Presentation

Use CSS as a template to control the layout and presentation of pages. Style sheets work separately from HTML and enable the site to be more easily maintained.

Use CSS font properties instead of the HTML font element to control the appearance of text.

User-Defined Styles

Individuals who require certain presentation features, such as specific color combinations or large font, should be able to override the author's style.

Quick Tips

- Avoid using cascading menus.
- Avoid opening new browser windows.
- Do not rely on rollover text to convey information.
- Stay away from pop-up windows.
- When a pop-up dialog box must be used, make sure the default action is the most forgiving.
- When new open browser windows are used, always provide a simple way to get back to the site's main homepage.

Adding text-only versions

While we recommend above (page 4, last bullet, Quick Tips of Graphics and Multimedia) that you avoid creating a text-only version of your site, if a text-only site is the only means to retrofit your site for accessibility then you should add text-only versions of pages. As mentioned before, text-only versions of pages assist screen readers which are very important pieces of assistive technology for the visually impaired. However, you must ensure that each time your site is changed or updated the corresponding text-only version of the page is also revised.

Conclusion - Implementation Considerations

Assess the current situation within an organization with regard to IT accessibility. General answers to the questions below can often be obtained very quickly, and can provide sufficient information to shape priorities in an implementation plan.

Key questions include:

- How accessible are your agency/organization's current applications?
- What is the level of IT accessibility expertise of individuals producing content for and designing applications in the agency/organization?
- What authoring tools are used in the agency/organization? Do they support the production of accessible applications?
- What is your agency/organization's centralized policy regarding IT technologies, style, and content.
- Does your agency/organization IT technology comply with both the Commonwealth's Web Site Standard (ITRM GOV106-00) and the Commonwealth's IT Accessibility Standard (ITRM GOV103-00)?
- Additionally, is your organization subject to external legislation and requirements (i.e. federal Section 508) regarding level of accessibility on its sites?